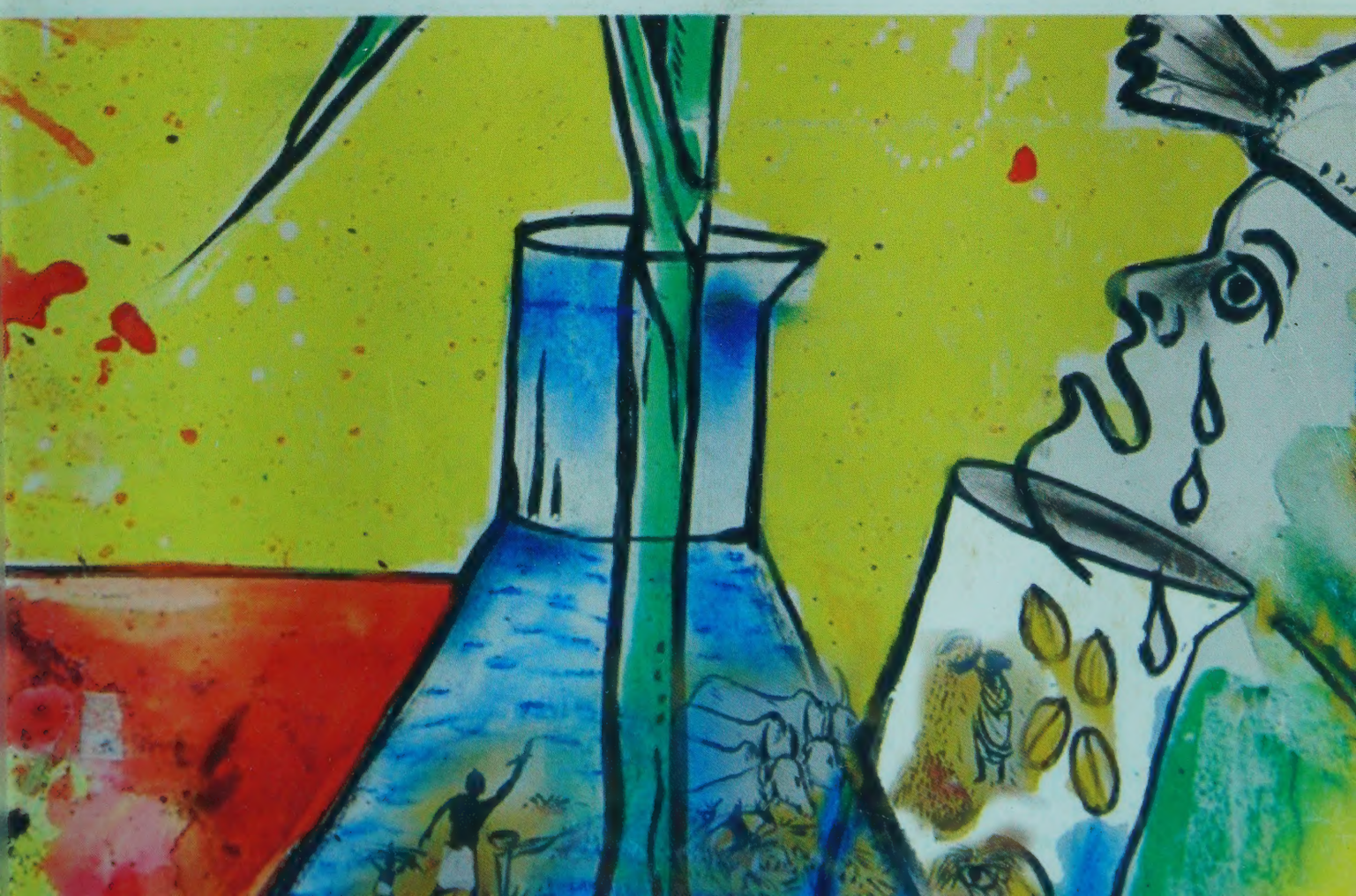
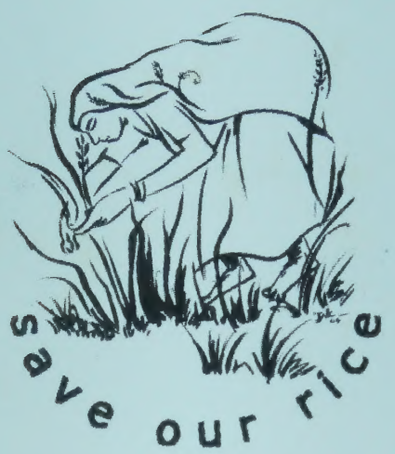
save our rice

GENETIC ENGINEERING ON RICE

A Fact Sheet

by
Sreedevi Lakshmi Kutty &
Karsten Wolff





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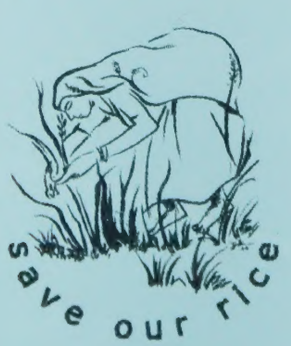

Section 1:

GE Rice

1) Introduction

Rice is the world's most important staple crop, growing in over 100 different countries. More than 90 % of the world production comes from Asia. Rice is the basis for the livelihoods of more than 2 billion people in Asia; more than 1 billion farmers across the region make a living out of rice cultivation, most of them small-scale farmers.

However, for Asians rice is much more than a staple crop or even a commodity, as conveyed in the statement from the people's movements in Asia: "Rice means life to us in Asia. It is the cornerstone of our food systems, our languages, our cultures and our livelihoods for thousands of years."[1] The spiritual significance is also expressed in the Sanskrit term for rice as "the one who supports humankind".

Rice is a cereal with an extraordinary number of varieties: the Vedas mention 500,000, recent statistics put that number around 100,000 varieties. Traditional varieties are adapted to their respective local conditions and serve multiple purposes: besides the basic use as a food crop, rice is also known for its medicinal properties: useful for pregnant and lactating women, used to relieve rheumatism, headache, lung diseases and epilepsy.

The traditional, multi-functional agricultural systems in Asia changed with the introduction of so-called 'high-yielding varieties' (HYVs) of rice during the Green Revolution. In order to realise a higher yield, these dwarf varieties have to be cultivated in monocultures with high inputs of chemical fertilisers, pesticides and irrigation, therefore they should rightfully be called 'high-input varieties' (HIV).

The massive introduction of HIVs led to rice monocultures, and subsequently the biodiversity in the rice fields as well as the farmers' wisdom about seeds and agriculture eroded. Farmers who got on to the treadmill of expensive

1 Save Our Rice Campaign, http://www.panap.net/en/r/page/rice/35

inputs but couldn't afford to buy the expensive seeds and inputs every season, year after year, ended up in a cycle of indebtedness and many eventually lost their lands and in despair many sadly gave up their lives as well. Furthermore, the Green Revolution opened up huge business opportunities for agrochemical Transnational Corporations (TNCs), selling fertilisers, pesticides and increasingly seeds. These are the same companies now developing and pushing for the introduction of genetically engineered (GE) rice.

The hybrid rice research has become a launching pad for research on genetically engineered rice and the two types which are being extensively developed and tested are insect resistant rice and herbicide tolerant rice. GE rice created by inserting alien genes into rice is ostensibly being developed to address global hunger, however it will only lead to larger and larger monocultures of a narrow spectrum of GE rice. In addition the traditional rights of Asian farmers over their rice germplasm will be lost with the patented GE rice flooding the markets and traditional and improved varieties slowly disappearing. Past experience has demonstrated that whenever GE crops are introduced, the non GE varieties are withdrawn from the market creating complete dependence on the expensive, patented GE crop.

GE rice poses a serious threat to rice cultures of Asia, the tens of thousands of traditional, locally adapted rice varieties and farmer knowledge systems of rice growing and above all the food sovereignty of the continent which is largely populated by rice eating people.

2) Types of GE Rice

As yet no genetically engineered rice is approved for commercial cultivation anywhere in Asia. However, there are several types of GE rice in the laboratories and in field trials across the region.

BB Rice : BB rice is a variety where a gene for bacterial blight resistance (Xa21) obtained from an African wild rice variety is introduced.

Bacterial blight is a disease that affects both seedlings and mature plants. The leaves turn into straw colour, roll completely and the tillers wither away. Infected plants lose leaf area and may produce fewer and poorer quality grains. High humidity and excessive nitrogen application favour the spread of BB.

However, bacterial blight is not a major agricultural problem in Asia. Furthermore, the bacterial blight pathogen is highly adaptable, it will overcome the resistance based on a single gene and eventually lead to the appearance of more virulent strains. BB rice is unnecessary since bacterial blight can be dealt with conventional means and through cultural methods.[2]

Bt Rice: Bt rice contains genes from a soil bacterium called Bacillus thuringiensis (Bt) which enable the plant to produce toxins killing the larvae of rice stem borer pests. Different types of Bt rice are being field-tested now across Asia, producing slightly different versions of the cry toxins, such as cry1Ab , cry1Ac, cry2Ab.

Stem borers are caterpillars that live in the rice stems, eventually turning into moths. Stem borers can destroy rice at any stage of the plant from seedling to maturity. Studies on other Bt crops (such as cotton and maize) demonstrated that Bt does not reduce the use of pesticides in the long run, due to increase in secondary pests and eventually development of resistance amongst the target pests[3] [4] Furthermore, it is known that the Bt toxins can persist in soils thereby impacting microbial activity in the soil, resulting in reduction of soil fertility.[5]

Stem borer is a low level chronic pest in Asia, causing an average yield loss of just

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2 Future of Rice, Greenpeace International, November 2006, http://www.greenpeace.org/international/Global/international/planet-2/report/2006/11/future-of-rice.pdf

3 Kranthi, K.R. (2010).Bt Cotton: A critical appraisal.

4 Alternative pest management methods which can contain the pest are the use of neem kernel extract as well as the removing of weeds that are egg laying spots for the stem borer.

5 Turrini, A., Sbrana, C. & Giovannetti, M. (2008) . Experimental systems to monitor the impact of transgenic corn on keystone soil microorganisms

2.4 %.[6] Alternative pest management methods which can contain the pest are the use of neem kernel extract as well as the removing of weeds that are egg laying spots for the stem borer.

HT Rice: Herbicide tolerant rice is genetically engineered to resist glyphosate (called Roundup Ready from Monsanto) and glufosinate (Liberty Link by Bayer CropScience). The LL601 rice of Bayer is the only HT rice approved for commercial production in the USA. That too happened because the LL rice contaminated the conventional rice in the US and post facto approval was granted by USDA for the commercial planting of that trait[7] Weeds are a major problem in large scale industrial mono-cropping. HT crops are engineered to resist a single herbicide, so this herbicide can be sprayed, destroying all plants other than the genetically engineered crop that can tolerate the herbicide.

It was predicted by independent scientists that use of one herbicide in very large quantities season after season would result in weeds developing resistance. The US has already experienced this with HT corn, cotton and soybean. 'Superweeds' as they are called have afflicted more than 11 million acres of farm land in the US and this is expected to double in the next few years.[8] US farmers growing HT crops are compelled to use cocktails of deadly herbicides, which were earlier phased out, to deal with this devastating problem.[9] [10]

The cultivation of HT rice is not suitable for small holder ecologically bio-diverse paddy cultivation in densely populated Asian countries. Integrated

6 Future of Rice, Greenpeace International, November 2006, http://www.greenpeace.org/international/Global/international/planet-2/report/2006/11/future-of-rice.pdf

7 http://www.greenpeace.org/raw/content/international/press/reports/rice-industry-in-crisis.pdf

8 http://deltafarmpress.com/aphis-deregulates-ll601-rice-trait & http://www.aphis.usda.gov/brs/aphisdocs/06_23401p_ea.pdf

9 Farmers cope with Round Up resistant weeds , NYTimes , May 3, 2010, http://www.nytimes.com/2010/05/04/business/energy-environment/04weed.html & Genetically Engineered Backslide: The Impact of Glyphosate-Resistant Palmer Pigweed on Agriculture in the United States, Edward Hammod , Third World Network

10 Bloomberg, Business week (2011, September 8) . Attack of the superweed. http://www.businessweek.com/magazine/attack-of-the-superweed-09082011.html

farming provides a wide range of alternatives for weed control, making HT technology unnecessary. Mulching has been very effective in weed management. In addition, a large segment of the population particularly women, depend on paddy cultivation related work for their livelihood. The extensive use of herbicides will result in loss of biodiversity and could also result in the destruction of uncultivated sources of food from paddy fields and surrounding areas, thereby increasing food insecurity. In addition extensive use of herbicides is a health hazard for farmers and farm workers.

Golden Rice: Golden Rice is engineered to produce beta-carotene in the endosperm and aims to address the problem of vitamin A deficiency, which is causing night blindness especially among children. The term golden rice is itself a public relations strategy to gain acceptance for this rice. The name actually comes from the yellow colour that the rice has due to introduction of the daffodil genes. Golden Rice is most prominently highlighted by the industry in order to push for GE rice in general.

However, there are serious questions whether Golden Rice can really provide the amount of beta-carotene needed to achieve the recommended daily allowance of vitamin A for children. Furthermore, pro-vitamin A requires dietary fat for absorption in the human intestine, while children with symptoms of vitamin A deficiency generally also suffer from protein-energy malnutrition, which interferes with the absorption of beta-carotene.[11]

On the other hand, there are plenty of alternative, cheaper and healthier sources of vitamin A, such as fruits, green vegetables and unpolished rice, making Golden Rice dispensable.

Pharmaceutical Rice: Japanese researchers have inserted a gene from the human liver into rice to enable it to digest pesticides and industrial chemicals. The gene makes an enzyme which can break down harmful chemicals in the body. The

11 Lorche, A. (2005). Vitamin A deficiency: diverse causes, diverse solutions. A report prepared for Greenpeace International. http://www.greenpeaceweb.org/gmo/vitamina.pdf.

American company 'Applied Phytologics' is producing rice genetically engineered with two human genes producing the proteins lactoferrin and lysozyme, to protect plants against fungal and animal pests. 'Ventria Bioscience' in California is also developing rice containing human genes to produce lactoferrin and lysozyme. This genetically engineered rice is to be used as a treatment for diarrhoea.[12]

These experiments, along with other researches introducing pig genes into rice, trigger serious ethical and food safety questions. Phamaceutical compounds are usually substances that need to be taken in specific and minute quantities when people are unwell. Therefore field trials or subsequent release (if any) of pharma crops is a serious threat to food safety and human health due to contamination issues. Once released into the environment they can't be controlled. The Pharma crops could very easily contaminate the regular rice varieties thereby enter our food chain leading to all of us consuming unwanted pharma molecules. In addition this is an added threat to vulnerable populations like the elderly, infants, pregnant women, and invalids who could be affected more.[13]

In addition other types of GE rice are also under research and trials. There is GE ferritin rice which is engineered with the ferritin gene from soybeans to increase iron and zinc levels. Another GE rice experiment which has gained currency is transgene based process for production of maintainer rice lines for hybrid seed production technology (SPT). This is to facilitate large scale production of non-genetically modified male sterile rice lines which can be used as female inbred parents for subsequent hybrid seed production.[14]

12 Kuruganti, K. & Ramanjaneyalu G. V.(2008). Genetic Engineering in Indian Agriculture- An introductory handbook. Retrieved from http://sejswhirlpool.files.wordpress.com/2009/02/ge-handbook-csa-march2008.pdf

13 UCS Position Paper on Pharmaceutical and Industrial Crops, http://www.ucsusa.org/assets/documents/food_and_agriculture/ucs-position-pharma-and-industrial-crops.pdf

14 GEAC meeting103, 29/09/2010 http://www.moef.nic.in/divisions/csurv/geac/decision-sep-103.pdf

Golden Rice

The original Golden Rice was mostly designed and created in public laboratories. The levels of beta-carotene (Pro-Vitamin A) produced by this Golden Rice were very small and widely criticised. Golden Rice number 2 (GR2) is based on the original design, but uses fewer or different genes and is said to produce higher levels of Pro-Vitamin A than its predecessor. GR2 was solely developed by Syngenta, which used the attention of World Food Day on 16 October 2004 to announce the donation of its GR2 to the Golden Rice Humanitarian Board, under the same conditions and licensing terms as the previous Golden Rice.

Experience and data gathered with GR2 so far seem to indicate that the beta-carotene levels achieved in the harvested grain drop quickly during storage, thus not offering the expected improvement. Given the true causes of Vitamin A deficiency (VAD), GR2 offers no more effective an answer to VAD and malnutrition than the original Golden Rice. The following commentary from the book *Hungry Corporations* therefore still holds true: "The problem is not a lack of foods containing vitamin A and beta-carotene, but a lack of access to these foods. It is 'hidden hunger', including the loss of knowledge about the relation between diet and health, and the consequences of eating only rice. Furthermore, Vitamin A and beta-carotene are fat-soluble nutrients and can only be properly absorbed in the presence of oil and other components. Children who suffer from diarrhoea due to dirty water and poor hygiene conditions will not be able to take up or retain nutrients like Vitamin A from their food."

Many plants are sources of Pro-Vitamin A, especially carrots, yellow cassava, yellow sweet potato, mangoes and apricots (also in dried form), leafy greens such as spinach, coriander, radish leaves, and, most of all, red palm oil.

Source: GE Rice- The Genetic Engineering of the World's Leading Staple Crop, Dr.Ricarda A. Steinbrecher, PANAP Rice Sheets.

3) Status of GE Rice

Laboratory testing as well as field trials of GE rice are now taking place in some countries in Asia. However, no GE rice variety has been approved for commercial cultivation in any Asian country.

Illegal GE Rice Contamination of the Food Chain

The contamination of US long grained rice by GE rice under field trial is one of the most infamous contamination scandals in the GE rice saga. In 2006, one of Bayer's genetically engineered herbicide-resistant rice strains (LL601) contaminated US long grained rice. In August 2006 the USDA confirmed the contamination of the rice supply by an experimental GE rice variety of Bayer. Though only ever grown in trial plots, it managed to contaminate two top rice varieties grown in the US, namely Cheniere and Clearfield 131. The GE rice (known as LL601 Rice) is engineered to withstand application of the herbicide glufosinate. LL601 was not approved in any country of the world and has not gone through any safety assessments regarding its effect on human health and the environment.[15]

The contaminated rice was subsequently found in the food chain of many other countries worldwide. [16] Japan immediately announced that they are suspending US long-grain rice imports. The European Union adopted emergency measures and required imports of long-grain rice from the USA to be certified as LL601-free.[17]

US rice farmers filed numerous cases against Bayer, and they came to trial in 2009-2010. After a series of farmer victories against Bayer in 2010, the

15 Steinbracher, R. (2007). GE Rice- The genetic Engineering of the World's Leading Staple Crop. PAN AP Rice sheets.

16 FOE Biotechnology programme & European GMO Campaign 05/12/2006, http://www.foeeurope.org/GMOs/rice_contamination.htm

17 GM rice: (European)Commission to propose strict counter testing of US rice imports, 19/10/2006, http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/1437&format=HTML&aged=0&language=EN&guiLanguage=en

company finally reached a settlement with the US long grain rice farmers.[18]

China is one of the leading rice producers and consumers in the world and Chinese authorities are discussing the approval of GE rice, but due to environmental and health concerns as well as fears of losing export markets, commercial production of GE rice is not allowed in China. The decision of the Chinese biosafety committee is crucial, since many Asian governments are closely monitoring China's policy on GE rice, and it is very likely that the approval in China would lead to approvals in other countries as well. As per latest reports China has suspended the commercialization of GE rice.[19]

Despite this clear legal situation in China, illegal Bt Rice was found in two provinces in 2005,[20] and subsequently exported to other countries as well. It is very likely that this was not an accident, but that scientists and seed factories are trying to push the authorities into a decision by making the controversial product so widely available that there is no turning back.

3) The Driving Forces behind GE Rice

When looking at who is behind the drive for genetically engineered rice, a mixed picture emerges. It is dominated by large multinationals and a few research organizations. The narrative is similar to that of Green Revolution; concern is being expressed as to how to feed growing populations around the world. Everyone involved is pointing at the predicted population figures of 8.9 billion by 2050 while some refer specifically to the numbers suffering from hunger and malnutrition today. For both scenarios, the main solution being put forward is a single technology-genetic engineering- which is not proven to be safe or effective however the seed industry and many in the scientific community have total faith in this technology!

18 Bayer Agrees to Pay $750 Million to End Lawsuits Over Gene-Modified Rice (2011, July). http://www.bloomberg.com/news/2011-07-01/bayer-to-pay-750-million-to-end-lawsuits-over-genetically-modified-rice.html

19 China says No to commercialization of GE rice? (October, 2011) . http://www.greenpeace.org/eastasia/news/stories/food-agriculture/2011/china-halts-ge-rice-commercialization/

20 GE rice planted and sold illegally in China (2005). http://www.twnside.org.sg/title2/service187.htm

The Race for the Rice Genome

The project to obtain the complete DNA sequence of all the genetic information (genome) of rice was started by Japan in the 1990s. Eventually, in 1997, the International Rice Genome Sequencing Project (IRGSP) was launched as a public project. It was widely recognised that having genetic information on rice also opened up a gateway for all other cereal food crops. Furthermore, the reward was not only knowledge; patent protection could also be secured. For these reasons, private companies quietly joined in the race.

In April 2000, the agro-biotechnology company Monsanto announced it had completed its own draft sequence for the rice genome, which still had numerous gaps. Though offering to share the information, control over the intellectual property remained largely with Monsanto. In January 2001, another draft version was announced by the agro-biotechnology company, Syngenta.

In December 2002, the IRGSP finally announced the completion of a high quality draft sequence, which was finalised and published by August 2005. In the meantime, Chinese scientists had worked on the sequence of *Indica* rice – the main rice variety in China and many Asian countries. In April 2002, their draft sequence was published in *Science*.

Source: GE Rice- The Genetic Engineering of the World's Leading Staple Crop, Dr.Ricarda A. Steinbrecher, PAN AP Rice Sheets.

Major players:

Transnational biotechnology companies that have clearly stated their interest in marketing/ commercialising GE rice are Monsanto, Bayer, Syngenta and the seed company Delta &Pine Land. (See box for details)

Non-Corporate Players

The private sector has set up public-relations organisations such as the International Service for the Acquisition of Agri-Biotech Applications (*ISAAA*), which claims to contribute to poverty alleviation by transferring biotech applications to developing countries, but in fact is simply a lobby organisation of the GM industry. ISAAA is funded by the developers of GMOs, with the aim of helping developing countries in the South take up GM technology. Funders include Bayer CropScience, Monsanto, Syngenta and Pioneer Hi-Bred. ISAAA continuously provides propaganda regarding global adoption rates of GM crops and brings out an annual report on GM crop adoption around the world. Among the public institutions increasingly supporting GE (rice) are the Food and Agriculture Organisation (FAO) of the United Nations and the International Rice Research Institute (IRRI). During the 'International Year of Rice' 2004, *FAO* stated that a lack of productivity is the reason for hunger and malnutrition and therefore technical solutions have to be developed to close the yield gap in rice cultivation IRRI was established in 1960 by the Ford and Rockefeller foundations in cooperation with the government of Philippines. Its research activities began in 1962 and in the mid-1960s the IRRI's launch of a high-yielding dwarf rice variety (IR8) was a significant contribution to the Green Revolution in Asia. In 2001, IRRI had launched its controversial Golden Rice project. IRRI's Director-General, Ronald Cantrell was quoted as saying, "The arrival of these initial samples at IRRI is a very significant step and allows us to finally start on the required testing processes using local rice varieties.[21]" In the decade following that declaration IRRI has not changed its stance regarding GE rice or 'golden rice'. IRRI expects to play a major role in the ongoing "Golden Rice" research effort and its eventual introduction to the world's millions of poor rice farmers and consumers.

IRRI holds the rice germplasm in trust and had a policy that it will not seek any patent protection for the genetic resources held in trust. However in November 2010 they have amended and approved a more aggressive IPR framework. According to the new rules materials developed by IRRI's breeders, either hybrids or GE rice,

21 Golden Rice arrives in Asia. http://www.mindfully.org/GE/Golden-Rice-IRRI-Testing.htm

can seek IP protection and the policy explicitly endorses 'biotechnological innovations'.[22] Instead of prioritizing genuine food sovereignty, farmers' rights and knowledge, IRRI prioritizes collaboration with TNCs. In these "public-private partnerships", IRRI relies on the invaluable wealth of rice diversity, freely received from farmers all over Asia and kept in its gene bank, as its main bargaining chip.

Monsanto, a US-based agro-chemical corporation and world number one seed company, has developed both herbicide-tolerant as well as insect-resistant genetically engineered rice. Their Roundup Ready rice (RR rice) is tolerant to Monsanto's glyphosate-based herbicide Roundup. Since 1998, about 50 field trials have been carried out in the US. In India, Monsanto is also known as Mahyco-Monsanto Biotech (MMB) or in the form of its seed partner, Mahyco (Maharashtra Hybrids Seeds Co Ltd). Monsanto exists as 3 entities in India, Monsanto India ltd [which focuses on herbicide and hybrid corn], Monsanto Holdings India ltd [which has 26% share in Mahyco and MMB [which sells Monsanto technologies to Indian companies]. Having already commercialised its Bt cotton (Bollgard) in India, Mahyco wants to commercialise its Bt rice first in India

Bayer CropScience, with headquarters in Germany, took over from Aventis CropScience, which used to be AgrEvo. It is a company haunted by GE contamination scandals. The first was 'Starlink', a genetically modified Bt maize not approved for human consumption but grown as animal feed. This maize found its way into the human food chain on a global scale in 2000 and 2001, including in European Union countries and Japan. Products had to be withdrawn from the shelves internationally.

Syngenta is involved with Golden Rice, especially Golden Rice 2 (GR2). In 2000, Syngenta (then Zeneca) emerged as the main actor with regard to patents and licensing agreements for the original Golden Rice (GR1).

22 Eye on IRRI. IRRI moving down the IPR alley.(2011). http://www.panap.net/sites/default/files/eyeonirri_irrimovingdowntheipralley.pdf

Part of the agreement reached was that "resource-poor farmers in developing countries" would not have to pay royalties or technology fees as long as they generate less than USD10, 000 annually. It has also developed GE rice varieties and conducted field trials in the US: for herbicide-resistance, insect-resistance and seed composition.

Delta & Pine Land (DPL) is the world's largest cotton seed company. DPL bought Syngenta's global cotton seed business in May 2006, and has now, for example, cotton seed germplasm and distribution assets in each of the three primary cotton growing regions of India. Monsanto announced in August 2006 that it was to buy DPL for USD 1.5 billion. Whilst there was opposition, the sale eventually went through.

DPL is not only the largest cotton seed company, but also the inventor and co-patent holder of "*terminator technology*". "Terminator" is a genetic engineering technology that makes plants grow sterile seeds. Farmers can thus no longer save seeds but need to buy their seeds from seed companies every year. There is an international campaign by civil society to ban terminator technology, and the UN Convention on Biological Diversity has declared a moratorium on it. DPL have repeatedly asserted that their aim is to develop the sterile seed technology for three plants: soya, wheat and rice.

The consequences of rice seeds being marketed with terminator technology is illustrated by the following statistics, supplied by the ETC in 2006: In the Philippines, 59% of the rice crop is planted with farmer-saved seeds. If these rice farmers were forced to buy new seed every time they planted - they would spend an estimated USD 172 million per annum.

Ventria Bioscience, with its headquarters in California, US, is aiming "to become a scientific leader in the biopharmaceutical industry." Their claim is that their science and patented technology "make it possible for Ventria to address unmet and underserved needs in human and animal health by delivering affordable

treatments on a global scale." It is ironic that they should choose to use rice as their "production system" for pharmaceuticals, thus threatening to contaminate and undermine the world's most important food crop, upon which more than half the world's population depend for their daily needs.

In fact, there is a lot of money in pharmaceuticals, and plants appear to offer a cheap production system. Rice has been bred and selected by generations of farmers for thousands of years to efficiently produce proteins, starches and other compounds locked into a seed that can be stored easily until required for consumption. It is exactly this quality that is sought by pharmaceutical companies.

Others hold that this dream of rice or other plants being a "cheap production system" does not reflect reality but is ultimately rather expensive, and highly problematic with regard to contamination.

Ventria seems also to have chosen the cheaper option of marketing its GE rice and its GE rice proteins not as pharmaceuticals or infant formula, but as food and drink supplements. Thus it can avoid the costs and the rigour of clinical trials. Nevertheless, it proposes it as an over-the-counter rehydration drink, especially intended for children in Third World countries suffering from diarrhoea.

Source: GE Rice- The Genetic Engineering of the World's Leading Staple Crop, Dr.Ricarda A. Steinbrecher, PAN AP Rice Sheets.

5) Risks of GE Rice

Genetic Engineering is not a precise science, but a crude technology with unpredictable consequences. GE crops are presenting escalating problems for farmers and posing unacceptable risks to health and the environment.

This is especially true for GE rice, since Asia is the centre of origin of rice,

with a huge variety of wild species. Although rice is a self-pollinating crop, out crossing to conventional rice and weedy relatives can happen – and has already happened. If an herbicide resistant rice variety contaminates wild rice, it is very likely that this wild rice will become a problem weed. The loss of biodiversity due to the contamination of the natural gene pool represents a huge risk to food security in Asia.

Producing Bt rice also causes huge health risks for the consumers. Since the plant produces a toxin that kills pests, nobody can say for sure that this toxin will not endanger the human health as well. The Bt cry 9c gene introduced into the rice plant is the same as the one used in Starlink corn in the USA and is suspected to have allergenic properties and therefore banned for human consumption in the US.

Equally threatening are the social, cultural and economic risks of GE rice. The real purpose of GE rice is to expand corporate control over the world's most important staple crop. "To properly understand the means one must first understand the end. A farmer who doesn't borrow money and plants his own seed is difficult to control because he can feed himself and his neighbours. While farmers in America today are little more than tenants serving corporate interests, the rural Asian farmers has remained relatively out of the loop – until now. That is what the "Gene Revolution" is all about: Seeking control over an agricultural sector, that to a certain extent still remains outside a capitalistic logic of exploitation."[23]

The increasing commercial interest of transnational corporations in the rice sector and the incapability and unwillingness of the public sector to carry out farmer friendly land based rice research, which would help resource-poor farmers, is leading to a situation where the commoditization of the whole Asian rice bowl becomes an imminent threat. Keeping out GE rice is the only way to protect the Asian rice bowl!

23 Steinbrecher, R. (2003) . Hungry Corporations.

Section 2:

GE Rice - Indian Scenario

Introduction

Global biotechnology and seed corporations have come and set up shop in India in a big way, they view India as the largest potential seed market. They have set up research centres and seed production and distribution facilities in the country. Research on genetically engineered (GE) rice is being carried out by many of these players.

The major seed companies that are working on GE rice in India are Maharashtra Hybrid Seed Company (Mahyco), Bayer BioSciences, DuPont, Avasthagen, JK Agrigenetics, BASF India Ltd. Currently Mahyco, Bayer BioSciences and DuPont have received approvals for field trials of GE rice. Among the public sector players the Indian Agricultural Research Institute

(IARI), Tamilnadu Agriculture University (TNAU), and Kolkata University, West Bengal have received approvals for field trials of GE rice.

The genetic manipulation of rice, patenting of the rice gene, and the increasing corporate control over rice by various transnationals is causing major concern amongst farmers' movements, rice farmers and civil society groups. No GE rice has been approved for commercial cultivation. However a number of field trials of GE rice are being regularly approved by the Indian regulator. As one seed company head said, GE rice is a "huge opportunity" for the transnational seed companies, even though they generally invoke the spectre of hunger and malnutrition to aggressively promote GE rice.

GE rice trials in India

The Genetic Engineering Appraisal Committee (GEAC), the biotechnology regulator has been approving field trials of various (GE) rice traits of the different seed companies and public sector agriculture research institutions. However the field trials have been very contentious with many of them violating norms and facing protests from farmers and civil society.

Instances of rampant violations during field trials, conducting field trials before completion of bio safety tests and conflict of interest within the GEAC were submitted to the Supreme Court of India by the petitioners of the public interest litigation (PIL)[24] seeking a moratorium of GM crops for 10 years. In response the Supreme Court directed on 22/09/2006 that no GE crop field trials were to be approved till the court issues further orders. Later in 2007 the Supreme Court informed GEAC on 08/05/2007 that GE crop field trial approvals could be granted subject to certain conditions.

The Supreme Court directed GEAC that all GE crop field trials should be conducted

24 A public interest litigation (PIL) was filed in the Indian Supreme Court in 2005 by Aruna Rodrigues and 2 others asking for a 10 year moratorium on GM crops in India, the hearings are still going on, one of the interim decisions of the court was to appoint two scientists as independent observers in GEAC

subject to the following conditions[25]:

1. All trials should have a lead scientist's name with contact details who would be responsible for all aspects of the trials including regulatory requirements.
2. An isolation distance of 200 m would be maintained during field trials.
3. Prior to bringing out the GM material from the green house for conduct of open field trial the Company should submit a validated event specific test protocol at an LOD of at least 0.01% to detect and confirm that there has been no contamination

Initially the field trials were being carried out in farmers' fields. In 2008, in response to an interim application filed by Gene campaign regarding violations during Mahyco GE rice field trials the Supreme Court directed that all future field trials are to be carried out only on company research farms or long leased lands. Many of the field trials are being carried out in premises of government research institutions.

In March 2011 in response to the objection from the Bihar Chief Minister to open air field trials of GM crops in his state, the Environment Ministry took a decision that GEAC should give go ahead for GM crop field trials only after obtaining consent from the concerned state, as agriculture is a state subject.[26] During its July 2011 meeting GEAC made NOC from states a mandatory precondition for GM field trials.[27] After this decision was taken Bihar, Chhattisgarh, West Bengal, Karnataka and Rajasthan joined Kerala, Himachal Pradesh, Madhya Pradesh and Orissa in saying No to field trials. Tamil Nadu and Maharashtra have also not issued any NOCs for field trials since July 2011. Currently Andhra Pradesh, Haryana Punjab

25 Minutes of the 76th GEAC meeting, page 1. http://moef.nic.in/divisions/csurv/geac/geac-may-76.pdf

26 One World South Asia. (2011). No field trials of Gm crops without state's nod: Jairam Ramesh. http://southasia.oneworld.net/todaysheadlines/no-field-trial-of-gm-crops-without-states-nod-jairam-ramesh/?searchterm=

27 Minutes of the 110th GEAC meeting held on July 6th, 2011. http://moef.nic.in/divisions/csurv/geac/DOC080711.pdf

and Gujarat are the only four states that have issued NOCs for GM crop field trials. After the July 2011 decision GEAC has granted approval for a few more GE rice trials , however only one rice trial by DuPont has begun after obtaining NOC from the state government (as per information provided on IGMORIS site)

The website of Indian GMO Research Information System (www.igmoris.nic.in) is the only ready source for tracking the field trials of GE crops. However the site does not provide information on location of trials or the season when the trials are being done, thereby denying the rights of the farmers and the public to know. A detailed table of GE rice field trials from 2006 to date has been created and provided below.

GE Rice Field Trials in India – from 2006 to September 2011

Sl no	GEAC meeting no/Date	Company	Location/s	Season	Trials	Trait	Gene/event & trial status
1	2006	M/s Mahyco Ltd.				Insect resistance	Cry1Ac, Cry2Ab
2	2006	Tamilnadu Agriculture University					rice chitinase (chi11) or tobacco osmotin gene
3	2006	Indian Agricultural Research Institute				Insect resistance	Cry1B-Cry1Aa fusion gene
4	78-	M/s Mahyco Ltd	Thanjavur (TN), Bhandara, Raigad (Maharashtra), 24 Parganas (WB), Durg (Chhattisgarh), Gaya (Bihar), Ranchi (Jharkhand), Davangere, Mandya (KA), Anand (Gujarat), Palakkad (Kerala) and Lucknow(UP)	Kharif 2007*	MLRT	Insect resistance	Cry1Ac six transgenic Bt rice hybrids namely MRP 5305 Bt, MRP 5319 Bt, MRP 5401 Bt, MRP 5445 Bt, MRP 5629 Bt and MRP 5631 Bt *(The Palakkad field trials did not take place due to opposition of the Kerala Government)*

	80-	M/s Mahyco Ltd	As above	Rabi 2007	MLRT	Insect resistance	Cry1Ac (as above)
5	79 - 8/8/2007	M/s. Metahelix Life Sciences Pvt. Ltd., Bangalore.	Karnataka**	Kharif 2007 (June-July 2007)	Elite event selection trials	Insect resistance	Cry1Ac
	82-	M/s Mahyco Ltd.	Maharashtra	Kharif	Pollen flow study	Insect resistance	Cry2Ab
6	88-	M/s. Bayer Bioscience Pvt. Ltd., New Delhi	Own R& D farm	Kharif 2008	Elite event election trials	Insect resistance	28 Bt rice lines
7	91-	M/s. Bayer Bioscience Pvt. Ltd	Own R& D farm at Hyderabad, AP	Rabi 2008-2009(Dec	Elite event selection trials	Insect resistance	41 Bt rice lines containing Cry 1 Ab, cry 1 Ca and bar genes
8	92-	M/s Mahyco Ltd.		Rabi 2008	For	Insect resistance	Cry1Ac- 20 Bt Rice events namely 2Bt-1 to 2Bt-20 containing cry2Ab
9	94-	M/s. Bayer Biosciences Pvt. Ltd	Own R& D farm at Hyderabad, AP	Kharif 2009	Elite event selection trials	Insect resistance	88 Bt rice lines with Cry1Ab, cry1Ca and bar genes

10	97-	M/s. Bayer Biosciences Pvt. Ltd	Crop Development Centre, Patancheru, AP	Rabi 2009-2010	Elite event selection trials	Insect resistance	Cry1Ca, Cry1Ab and bar genes 49 Bt rice lines events namely RICE1502-RICE1509, RICE1511, RICE1515, RICE1526, RICE1528, RICE1530-RICE1532, RICE1551, RICE1552, RICE1555, RICE1557, RICE1558, RICE1576, RICE1577, RICE1590, RICE2111-RICE2114, RICE2117, RICE2118, RICE2120, RICE3101, RICE3102, RICE3105-RICE3110, RICE3116-RICE3118, RICE3120-RICE3126, RICE3129 and RICE3130
11	100-	M/s. E. I. DuPont India Private Limited	KVK -		Event selection trials	To enable	9 events with SPT maintainer events containing *Os-Msca1* gene namely; DKC118, DKC45, JH02, JH04, JH11, JH15a, JH22, JH26b and JH34b. The events were developed by transforming M2O2 x T65 lines and then back-crossed into VIR54G9.

12	100-	M/s. Bayer Biosciences Pvt. Ltd	Crop Development Centre, Patancheru, AP		Event selection trials	Insect resistance	56 transgenic rice events containing Cry1Ab, Cry1Ca and bar genes. RICE1502-RICE1509, RICE1515, RICE1526, RICE1551-52, RICE1555, RICE1557-58, RICE1576, RICE2111-12, RICE2114, RICE3105, RICE3107, RICE3130, RICE3301-17, RICE3401, RICE3403-19 and LLRICE62 containing Cry1Ab, Cry1Ca & bar genes
13	103-	M/s. Metahelix Life Sciences Pvt. Ltd., Bangalore.	Institutional Research farm at	July 2010	Event selection BRL-1	Insect resistance	Cry1Ac and Cry1Ab events - MHR01 to MHR566

14	103-	M/s. Dupont Knowledge Center, Hyderabad (DuPont India Pvt Ltd)	**Company's owned land/ research farm in Bangalore (KVK Hadonahalli , Bangalore)		Event selection trials	To enable	Hybrid Rice SPT maintainer events) generated using the SPT1 and SPT6 Constructs 12 transgenic rice hybrids (*Oryza sativa* L) Events generated using SPT1 construct namely; JH 15b, JH 16a, JH 16b, JH 17, JH 25b, JH 26a, JH 36 of BC3 containing ZM-AA1-Os-MSCA1-DsRED2 genes and SPT 6 construct namely;J6-1-45a, J6-1-8, J6-1-4d, J6-1-10b, J6-1-7d containing Os-MSCA1-ZM-AA1-DsRED2 genes. Events generated using SPT1 construct namely; DKC376, DKC 550, DKC653, DKC413b, DKC413a, DKC615, DKC1049b, DKC1049a, DKC839, JH35, and JH37 of BC2 generation and DKC 320 of BC1 generation containing ZM-AA1-Os-MSCA1-DsRED2

15	104-	M/s. Bayer Bio Science Pvt. Ltd., Gurgaon.	Two locations - Crop Development Centre, Patancheru & Bayer Bioscience Pvt. Ltd., Davangere, Karnataka	Rabi 2010-2011	Event selection trials under net house	Insect resistance	Cry1Ab, Cry1Ca and bar genes transgenic rice events RICE 1502, RICE 1503, RICE 1504, RICE 1507, RICE 1515, RICE 1526, RICE 1551, RICE 1552, RICE 1557, RICE 1558, RICE 1576, RICE 2112, RICE 3130, RICE 3315, RICE 3316, RICE 3403, RICE 3405, RICE 3406, RICE 3407, RICE 3411, RICE 3413, RICE 3432, RICE 3435, RICE 3436, RICE 3437, RICE 3438, RICE 3439, RICE 3441, RICE 3442, RICE 3447, RICE 3449, RICE 3451, RICE 3457 and LLRICE62
16	104-	Department of Botany, University of Calcutta, Kolkata	Rice Research Station, Chinsurah, West Bengal****		Event selection trials	High iron content	Seven events : RICE 1502, RICE 1503, RICE 1504, RICE 1507, RICE 1515, RICE 1526, RICE 1551, FR19-7-3-4, FR19-7-3-5, FR19-7-7-3, FR19-11-7-4, FR19-11-2 (progenies of FR19-7 & FR19-11) containing ferritin gene for high iron content

17	104-	M/s. BASF India Ltd., Mumbai, 5.1	4 locations at TNAU , Coimbatore		Event selection	Higher seed yield	140 transgenic rice (Oryza sativa L) events with construct RPD5 containing OS ARGOS like, Leucine zipper gene; construct RPD8 containing AT-CDKB1;2, Cyclin Dependent Kinase gene; construct RPD10 containing OS ARGOS like, Leucine Zipper gene and construct RPD11 containing OS-hox5, Homeobox- Leucine Zipper gene
18	108-	M/s BASF India Ltd, New Delhi.	TNAU , Coimbatore			Higher seed yield	139 transgenic rice events
19	111	M/s. Bayer Bio Science Pvt. Ltd., Gurgaon.	Crop Development Centre, Patancheru & long leased land/company owned facility at Davangere, Karnataka		Event selection	Insect efficacy & herbicide efficacy	45 transgenic rice with 22 events containing *cry1Ab, cry1Ca and bar* genes +23 containing *cry1Ab, cry1C and cry2Ad*) Awaiting NOC from state government
20	111	M/s. JK Agri Genetics Ltd., Hyderabad.	Company's R&D Centre, Ranga Reddy, Andhra Pradesh		Event selection	Insect resistance	20 transgenic rice containing Cry1Ac gene *Awaiting NOC from state government*

21	112	M/s. Metahelix Life Sciences Pvt. Ltd., Bangalore.	Long leased land at Ranga Reddy District in Andhra Pradesh		BRL-1	Insect resistance	events namely MHR03, MHR05, MHR32, MHR174, MHR256, MHR83, MHR90, MHR95, MHR489 and MHR509 containing Cry1Ac and Cry1Ab gene *Awaiting NOC from state government*
22	112	M/s. E.I. DuPont India Pvt. Ltd., Hyderabad.	Yeldurti Mandal, Masaipet Village, Medak District, Andhra Pradesh		Event selection	Insect resistance	14 transgenic rice events generated using Bt39 (Cry1C+Cry2Ad), Bt40 (Cry1Ab+Cry2Ad) construct and Bt43 (Cry1C+Cry1Ab) constructs

23	112	M/s. E.I. DuPont India Pvt. Ltd., Hyderabad.	Medak District, Andhra Pradesh		Event selection	To enable	20 events of transgenic rice (*Oryza sativa L.*) generated using SPT1 construct expressing OS-MSCA1, ZM-AA1 and DsRed2 protein namely SPT1-3001, SPT1-3002, SPT1- 3003, SPT1-3004, SPT1-3005, SPT1-3006, SPT1-3007, SPT1-3008, SPT1-3009, SPT1-3010, SPT1-3011, SPT1-3012, SPT1-3013, SPT1-3014, SPT1-3015, SPT1-3016, SPT1- 3017, SPT1-3018, SPT1-3019 and SPT1-3020 *NOC obtained from state govt of AP and GEAC letter issued on 3/11/2011*

24	112	M/s. E.I. DuPont India Pvt. Ltd., Hyderabad.	Medak District, Andhra Pradesh		Event selection	To enable	20 events of transgenic rice (*Oryza sativa L.*) generated using SPT6 construct, expressing OS-MSCA1, ZM-AA1 and DsRed2 protein namely SPT6-1001, SPT6-1002, SPT6- 1003, SPT6-1004, S SPT6-1005, SPT6-1006, SPT6-1007, SPT6-1008, SPT6-1009, SPT6- 1010, SPT6-1011, SPT6-1012, SPT6-1013, SPT6-1014, SPT6-1015, SPT6-1016, SPT6-1017, SPT6-1018, SPT6-1019 and SPT6-1020 *NOC obtained from state govt of AP and GEAC letter issued on 3/11/2011*

Legend for trials:
Event selection
BRL-1- Biosafety research level-1
BRL-2 Biosafety research level-1
MLRT Multi location research trials

*Field trial could not be carried out in Kharif 2007 so permission was sought for and granted to conduct field trial in Rabi 2007.
**Information of place from the table in the minutes of the GEAC meeting 81 on 22/11/2007 (http://moef.nic.in/divisions/csurv/geac/decision-oct-81.pdf)
*** The minutes of the 82nd meeting say that this is merely an application for extension of period of trials from rabbi 2007 to kharif 2008 for pollen flow studies; however the previous meetings do not have any mention of approval of Cry2Ab rice. Previous approval was for Cry1Ac
**** The Field trials have not taken place as the state govt. of West Bengal has decided not to allow any GM crop trials.

- Table created from data gathered from GEAC minutes, IGMORIS website (www.igmoris.nic.in) and letters issued by DBT.
- The field trial approval information for the three trials approved in 2006 are not available either in GEAC minutes or RCGM minutes and data is taken from IGMORIS website without verification.
- Where ever columns are left empty information is not available in GEAC minutes or documents available
- All field trials approved after July 2011 require an NOC from the concerned state , therefore the initial GEAC approval is not a sufficient condition to begin field trials

The GE rice saga in India began with the approval of open air field trials of Mahyco's Bt rice in 2006. Field trials of GE rice have been approved across most rice growing states, except the Basmati rice belt which has been exempted[28]. The first three GE rice trials were approved in 2006 and the applicants were Maharashtra Hybrid Company Ltd (Mahyco), Tamilnadu Agriculture University (TNAU) and Indian Agriculture Research Institute (IARI). Even though Mahyco has sought permission for subsequent trials in succeeding years, the TNAU and IARI rice trials seem to have disappeared without a trace after that first instance in 2006. The perusal of the table reveals that after the two instances in 2006 all approvals for GE rice trials bar one have been sought by private companies. The only exception is a field trial approval sought by the Kolkata University in 2010. This clearly points to the trend that GE rice research in India is dominated by private and multinational seed companies. Another conclusion that can be derived from the table is that insect resistance is the most significant trait for which field trial approvals are being sought, clearly pointing to the tendency towards excessive dependence on Bt technology alone. It also points to the fact that the private companies are attempting to extend the application of Bt technology in cotton and consequent monopoly over the cotton seed sector, into rice as well.

Field trials and contamination issues

Field trials of GE rice are fraught with risks due to threat of it contaminating non GE rice varieties. This has been established by the huge problems faced by American rice farmers due to contamination incident from the trials fields of Bayer's Liberty Link rice which caused irreparable damage to American rice farmers.

This has also been recognized by the Indian regulator, GEAC. The discussions and decision made by GEAC regarding keeping Basmati rice growing areas free of GE rice trials is an admission that GE rice trials could cause contamination. GEAC in its 73rd meeting held on January 7th, 2007 discussed and decided on the request

28 Minutes of the 73rd GEAC meeting, http://www.envfor.nic.in/divisions/csurv/geac/geac-73.pdf

from the All India Rice Exporters Association to keep the Basmati growing areas/states free of GE rice. The request for not allowing GE rice field trials in Haryana, Punjab and Uttaranchal came from the rice exporters association, post the US long grained rice contamination episode. This US contamination episode opened a window for Indian rice exporters to export more rice to Europe.

During the 74th GEAC meeting the representative of the commerce ministry in GEAC said, "There is a general belief that no GM crop trials are safe and even after all the precautions are taken contamination may not be avoidable. He requested the Committee not to permit open field trials of food crops until all the safety tests are complete so as not to put exports of Basmati rice or other food crops in jeopardy."[29] Further, the rice exporters association met under the aegis of the Commerce Ministry and sought testing (at the company's cost) to ensure non contamination around GE rice trial fields, a cautionary deposit of rupees five crores (Rs.50 million) from the seed companies and other demands to ensure protection of their non GE rice. Most of the demands were not accepted by GEAC thereby giving up an opportunity to create a robust responsibility and liability regime for GE rice field trial and testing process[30].

Even though the Basmati rice growing belts of India are exempt from GE rice trials, the cradle of rice in India, the Chhattisgarh-Jharkhand- Orissa belt has not been exempted from GE rice trials and ironically one of the first GE rice trials took place in Jharkhand state. Chhattisgarh is considered to be the centre of origin for Indica rice. Dr.R.H Richharia, the legendary rice scientist was based in Chhattisgarh and his lifetime work involved the collection, preservation, multiplication and popularization of indigenous rice varieties. His rice germplasm collection numbered over 19,000

29 Minutes of the 74th GEAC meeting, http://www.envfor.nic.in/divisions/csurv/geac/geac-dec-74.pdf

30 Minutes of the 75th GEAC meeting, http://www.envfor.nic.in/divisions/csurv/geac/geac-dec-74.pdf

accessions[31].

Violations in Mahyco's GE rice field trials & Contamination!

The most egregious violations which have come to light with respect to GE rice field trials is the GE rice trials undertaken by Mahyco Ltd that took place in Jharkhand in 2008. In September 2008 after the trial was completed Dr.Suman Sahai of Gene Campaign[32], Delhi, found during her team's visit to Saparong taluka in Ratu district in Ranchi (Jharkhand), that field trials of GE rice were being conducted by Mahyco (based on approval received for Rabi 2007 season), flouting all laid down norms and guidelines[33]. The farmers whose fields were leased were unaware that GM rice was being grown on their land and the test fields were not isolated from the surrounding fields of paddy. There was no fencing, netting or any other protection measures to prevent contamination of the villagers' rice fields which surrounded the trial fields. People were also using the trial fields as a thoroughfare .

According to Gene Campaign the main paddy season in Jharkhand is from June to November which is when pest problems also manifest. These trials were conducted outside of the paddy season (when there is no pest infestation) rendering the trial and the data collected useless and irrelevant either to assess the real life pest situation or test the efficacy of genetically engineered Bt rice against pests[34].

The Gene Campaign staff who did the field survey reported that the company had employed a local farmer as caretaker and company officials were not present either during harvest or disposal of crop residue. Post harvest stumps had sprouted tillers and second generation rogue GE rice plants were present on the site. The straw was fed to cattle. However the company informed GEAC that they had destroyed all the plant material post harvest[35].

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31 Farmers battle for seed rights, Frontline , July-August 2003, http://www.hindu.com/fline/fl2015/stories/20030801000808000.htm

32 A research and advocacy organisation working to empower local communities to retain control over their genetic resources in order to ensure food and livelihood security, http://www.genecampaign.org/

33 http://www.genecampaign.org/Publication/Pressrelease/Bt-rice-trial-ranchi-sep8.html

34 http://hindu.com/2008/09/18/stories/2008091860931200.htm

35 Gene campaign petition in the Supreme Court of India, http://www.genecampaign.org/home_files/GM-PII-Bt-rice-contamination.pdf

In late 2008, Gene campaign filed an interim application in relation to their (PIL) against GM crops pending in the Supreme Court of India. Citing the serious violations with regard to Mahyco Bt rice field trials gene campaign sought (1) that all permissions granted to Mahyco for field trials be revoked (2) a moratorium on all approvals and field trials of GE crops till a proper regulatory regime is in place and (3) review all the approvals/ permissions granted by GEAC.

Gene Campaign staff collected samples from seeds and leaves from the second generation plants which had come up and also the plant residue left on the bunds and sent them for tests. In January 2009 they received the test results which confirmed that these plant matter contained Cry1Ac gene[36]. This proved beyond doubt that Mahyco had due to its negligence allowed the Bt gene to escape from trial fields to the environment. This was particularly significant and worrying as the contamination had happened at a site which has among the greatest rice diversity in the country. There has been no action from GEAC on these reports.

Conflict of Interest in Kolkata University GE rice trial approval

GEAC granted permission to the University of Calcutta to conduct field trials for their GE rice during the104th meeting on 15/11/2010[37], however the original permission was granted subject to the trial fields maintaining an isolation distance of 200 metres (the norms developed based on the Supreme Court directive). The applicants had sought field trial approval with an isolation distance of 10 metres.

A conversation with officials at the Chinsurah, Rice Research Station, by the Save Our Rice campaign coordinator W. Bengal and news paper reports revealed that it would not be possible to maintain an isolation

36 Press release from Gene Campaign Jan 20, 2009, http://www.genecampaign.org/Publication/Pressrelease/GM-Rice-contaminates-JK-Jan-20-9.html

37 Meeting minutes of GEAC meeting 104, 15/11/2010, http://www.moef.nic.in/divisions/csurv/geac/decision-nov-104.pdf

distance of 200 metres as there are rice plots all around and the university also has traditional germplasm of about 1200 varieties[38] conserved, which could be contaminated with this.

A later development occurred during the 106th GEAC meeting, the minutes revealed that Deputy Director General, ICAR raised a query about isolation distance and pointed out that the particular GE rice being a straight line variety, an isolation distance of three metres is sufficient, based on seeds certification standards. GEAC revised their previous decision to allow the trials with 10 metres isolation distance.[39] The decision is problematic as Dr.Swapan Datta, DDG-ICAR and member of the GEAC, instead of staying away from the decision making process, intervened[40] in the application pertaining to his spouse , Dr.Karabi Datta[41] the principal investigator of the concerned GE rice trials. This is a clear case of conflict of interest in decision-making within GEAC. In addition GEAC has nowhere until this decision distinguished between hybrid and straight line rice varieties and the isolation distance accepted by GEAC[42] for rice is 200 metres.[43]

Protests and action from farmers and civil society against GE rice in India.

In early Nov 2006, farmers from Tamil Nadu Farmers Association uprooted the trial crop of rice in Ramanathapuram village near Coimbatore. The owner of the field claimed that even though he had signed a contract with Mahyco allowing the trials, he was unaware that they were testing GE rice on his land. In October 2006, in Rampura village in Karnal district of Haryana, Bharatiya Kisan Union (BKU, a leading farmers union) members burned the GE rice trial plot to prevent

38 Chinsurah Centre to research GM rice, December 14th, 2010, Times of India , http://articles.timesofindia.indiatimes.com/2010-12-14/kolkata/28220395_1_rice-variety-gm-rice-rice-research-station

39 GEAC meeting 106 Minutes, http://www.moef.nic.in/divisions/csurv/geac/decision-jan-106.pdf

40 Minutes of the GEAC meeting 106, dtd 11/01/2011 http://www.moef.nic.in/divisions/csurv/geac/decision-jan-106.pdf

41 Dr.Karabi Datta profile, http://botany.caluniv.in/profile.asp?uname=kdutta

42 Cancellation of field trial approval of GM rice of Dept. of Botany, Calcutta University, Letter from Coalition for GM-Free India to GEAC dated July 2, 2011

43 Minutes of GEAC meeting 78 http://www.envfor.nic.in/divisions/csurv/geac/geac-jun-78.pdf

contamination, whereas in Rudrapur village in Gorakhpur district of Uttar Pradesh (U.P) BKU filed a complaint against Mahyco for violations found in the trial plot[44]. The local police seized the harvested grain. In 2007 there were instances of raids by farmers into GE rice trial fields in Tamil Nadu and in Punjab and harvested Bt rice was confiscated by the police based on farmers' complaints in U.P[45]. A common theme in all these instances was that the farmers who leased the land and signed contracts with Mahyco had no idea about GE rice. Farmer leaders were concerned that the companies were exploiting the ignorance of the farmers.

The various field tests being conducted, farmers fear, are already contaminating the vast indigenous rice gene pool of the nation which is reportedly among the largest in the world with 1, 40,000 known varieties.

Resistance to GE rice trials

GE rice field trials have always evoked strong emotions within the farming community, farmers groups and civil society groups. There have been numerous instances of protests and demonstrations against GE rice trials.

Bayer GE rice trials protests

On 22nd June 2009, Greenpeace activists along with other groups and farmers cordoned off a field where GE rice field trials by Bayer were taking place, and placed biohazard signs around[46]. The head of the Panchayath of the Chinna Kanjarla village had filed a complaint on the secretive nature of the trials and also about how mandatory rules like informing the local Panchayath were violated by the company. The GE rice being field tested was engineered with BT toxin and resistant to its own brand of herbicide

44 Crops on Trial, Dionne Bunsha, Frontline, Nov 18 2006, http://www.hinduonnet.com/fline/fl2323/stories/20061201003603000.htm

45 ibid

46 Greenpeace alerts nation that Indian Rice is in danger, June 22, 2009, http://www.greenpeace.org/india/en/news/greenpeace-alerts-indian-rise-in-danger/

Glufosinate. Glufosinate (trade name Basta/Liberty) has been banned and is to be phased out in Europe due to its hazardous nature. In the EU it is classified as toxic for reproduction, category 2 (R2), which means it can cause birth defects[47].Bayer is currently seeking approval for this rice in South Africa, India and the Philippines. In Brazil it withdrew its application for the approval of LL62 rice after sustained objections from farmers and scientific community there[48]. Even though Bayer's GE rice is approved in the US, American farmers have been reluctant to grow it due to fear of losing export markets.

DuPont GE rice field trial faces farmer wrath

The Genetic Engineering Appraisal Committee (GEAC) during its 100th meeting held on 12th May, 2010 granted permission for confined field trials for event selection (for 9 rice hybrids) on transgenic hybrid rice SPT (seed production technology) maintainer events by DuPont Knowledge Center, Hyderabad. [49] The permission was conveyed to DuPont to conduct the trials at Adonahalli Krishi Vigyan Kendra (KVK) at Doddaballapur, Bangalore Rural District[50]. As per GEAC minutes this is a new technology and the members in the panel themselves asked for a presentation from the company about the nuances and complexities[51].

On Nov 17th, 2010, farmers belonging to Karnataka Rajya Raitha Sangha (KRRS, a prominent farmers group and member group of La Via Campesina) entered the KVK campus and destroyed the GE rice. KVK has consequently decided to cancel the trial fearing public opposition. Dr. Venkata Reddy, VP, KRRS informed the media that they will not allow such open field trials as it would be a step towards surrendering our control over seeds to American multinationals and added that there are many environmental and health issues with GE rice[52]. They added that KVK had kept the neighbouring farmers in the dark about the GE rice trials, the

47 http://www.greenpeace.org/india/en/news/greenpeace-alerts-indian-rise-in-danger/

48 Bayer retreats and suspends its application for approval of Liberty Link rice in Brazil, http://www.foodfirst.org/en/node/3005

49 Minutes of the GEAC meeting held on 27/05/2010, http://www.envfor.nic.in/divisions/csurv/geac/decision-may-100.pdf

50 Letter from RCGM to DuPont dated 15/06/2010

51 Minutes of GEAC meeting 100, 12/05/2010, http://www.envfor.nic.in/divisions/csurv/geac/decision-may-100.pdf

52 Press release from KRRS, http://lvcsouthasia.blogspot.com/2010/11/karnataka-farmers-say-no-to-unsafe.html

local Panchayat was not informed and there were also other violations. KVK officials said that they were merely facilitators for the one year project received through the Dept. of Biotechnology[53].

In many of the above instances, criminal cases have been filed against the activists and farmers; however the larger issues of violation of rules and jeopardizing of biosafety by the companies while conducting open air field trials, the secretiveness with which the trials are conducted without informing local governments, the potential of contamination by GE trial crops are treated very casually by the regulator and no serious action has been taken in any case.

In the recent past there has been a resurgence of farmer resistance. There is increasing awareness among farmers and consumers about the dangers of GE crops and also the threats open air field trials constitute to bio safety and indigenous varieties. The rampant GE rice research and field trials being conducted by various seed multinationals in India is cause for serious concern on many counts. Contamination from GE rice trial fields is a reality and it is possible that many of our traditional rice varieties may already be getting contaminated.

Golden Rice in India?

The promoters of Golden Rice have been working assiduously to woo all South Asian and South East Asian rice growing nations. They promote golden rice as a solution to malnutrition being offered free to these nations battling hunger and malnutrition. Recently the golden rice project has found a new sponsor in the Bill & Melinda Gates Foundation which has promised 10.3 million dollars to International Rice Research Institute (IRRI) to support golden rice in Philippines and Bangladesh. India is also

53 Farmers destroy DuPont's GM rice, Down to Earth , Dec 15, 2010, http://www.downtoearth.org.in/node/2321

facing pressure to do trials of golden rice. It has come to light that the Rashtriya Krishi Vikas Yojana[54] budget of Bihar has allocated funds to the tune of RS 68.86 lakhs (6.8 million) in 2010-11 for development of golden rice for the various agro-ecological zones of Bihar[55]. The grant has been made to Rajendra Agricultural University in Samastipur, Bihar and it mentions that this is for research which has been going on since 2009-10. However Golden Rice has not ever been referred to GEAC for any kind of approvals or review.

Conclusion

Farmers and consumers all over Asia are resisting GE rice. Introduction of GE rice could become a threat to our food security and will also lead to loss of traditional seeds and loss of farmer control over seeds and make farmers completely dependent on seed companies.

Biodiversity based ecological rice cultivation provides alternative mechanisms for pest and disease control, without agrochemicals and genetic engineering. In a balanced rice eco-system, most of the pests and diseases which GE rice claims to address simply do not appear.

Stress tolerant rice is a talking point for the seed majors, with the current global focus on climate change issues. Reams of news print talk about break-through in salt resistant, drought tolerant, flood resistant rice varieties; however no applications for any such rice varieties have been submitted for approval in any country. However as in other crops the two major traits that the companies have developed in rice are – insecticidal toxin generation (BT) and herbicide tolerance (HT).

Rice , one of the oldest food grains in continuous use by mankind and which provides food and food security for half the human rice is a valuable heritage. India has an enormous collection of traditional rice germplasm, containing varieties

54 A government scheme to develop agriculture

55 Proceeding of the State Level Sanctioning Committee meeting of R.K.V.Y held on 25.05.2010 under the Chairmanship of the Development Commissioner, Bihar

which can address issues of climate stress, provide enhanced nutritional benefits, ensure high productivity, confer pest and disease resistance and have medicinal properties. We have a responsibility to grow these varieties of rice, conserve them and successfully preserve the bio diversity of rice varieties for the coming generations. Therein lies the key to food security and sovereignty. Tinkering with rice, as in GE rice experiments, is a threat to our rice biodiversity and security. Rice is our food, livelihood and our future!

Save our Rice Campaign aims to build a movement towards achieving food security and sovereignty, reviving rice culture and sustaining rice eco-system. Save Our Rice attempts to sustain rice by creating linkages between different sectors, developing capacities to address local/ regional concerns, building alternative models for sustainable ecological rice cultivation and developing a platform of people with rice culture as a common concern. The Campaign was launched in 2004 in the Second International Year of Rice in Kumbalangi, Keralam. The Campaign is coordinated by Thanal and CREATE. The Campaign is active in five states – Tamilnadu, Kerala, Karnataka, Orissa and West Bengal, where it is coordinated by partners in those States. The major campaign objectives are

- ☒ Conserving Rice Ecosystems
- ☒ Sustaining Rice Culture and Diversity
- ☒ Protecting Traditional Wisdom
- ☒ Preventing GMOs and Toxics
- ☒ Ensuring Safe and Nutritious Food